Atlantic Community School

Authentic Intellectual Work

Publish or Not Publish: Yes Date Scored: 1 December Date Revised:

Teacher – Ryan Coenen

Subject – Math

Grade – HS

Lesson – Graphing Linear Equations

IC Essential Skills and Concepts/Common Core – Understand, analyze, solve, and apply equations and inequalities.

List any use of technology integration –

Introduction/Background – The students haven't had to graph equations yet. Some, but not all, have used tables to graph their lines. This is the introduction into graphing using Standard Form and Slope Intercept Form.

Task – (Can attach)

NAME _____ DATE _____ PERIOD ____

4-5

Study Guide and Intervention

Graphing Linear Equations

Construction Only

Identify Linear Equations A **linear equation** is an equation that can be written in the form $Ax + By = C$. This is called the **standard form** of a linear equation.

Standard Form of a Linear Equation	$Ax + By = C$, where $A \geq 0$, A and B are not both zero, and A, B, and C are integers whose GCF is 1.

Example 1 **Determine whether $y = 6 - 3x$ is a linear equation. If so, write the equation in standard form.**

First rewrite the equation so both variables are on the same side of the equation.

$y = 6 - 3x$	Original equation
$y + 3x = 6 - 3x + 3x$	Add $3x$ to each side.
$3x + y = 6$	Simplify.

The equation is now in standard form, with $A = 3$, $B = 1$ and $C = 6$. This is a linear equation.

Example 2 **Determine whether $3xy + y = 4 + 2x$ is a linear equation. If so, write the equation in standard form.**

Since the term $3xy$ has two variables, the equation cannot be written in the form $Ax + By = C$. Therefore, this is not a linear equation.

NAME _____ DATE _____ PERIOD ____

4-5

Study Guide and Intervention *(continued)*

Graphing Linear Equations

Graph Linear Equations The graph of a linear equation is a line. The line represents all solutions to the linear equation. Also, every ordered pair on this line satisfies the equation.

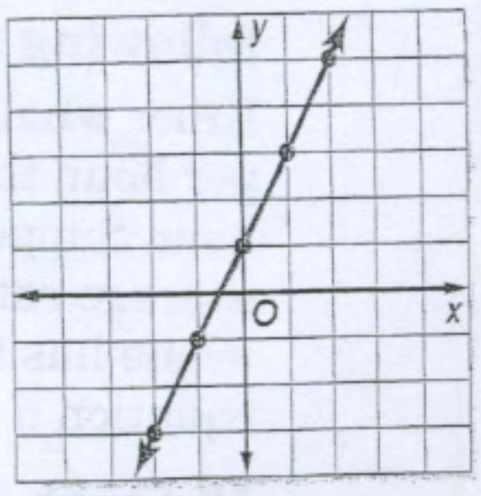
Example **Graph the equation $y - 2x = 1$.**

Solve the equation for y.

$y - 2x = 1$	Original equation
$y - 2x + 2x = 1 + 2x$	Add $2x$ to each side.
$y = 2x + 1$	Simplify.

Select five values for the domain and make a table. Then graph the ordered pairs and draw a line through the points.

x	$2x + 1$	y	(x, y)
−2	2(−2) + 1	−3	(−2, −3)
−1	2(−1) + 1	−1	(−1, −1)
0	2(0) + 1	1	(0, 1)
1	2(1) + 1	3	(1, 3)
2	2(2) + 1	5	(2; 5)



NAME _____ DATE _____ PERIOD ____

4-5 Practice

Graphing Linear Equations

Determine whether each equation is a linear equation. If so, write the equation in standard form.

1. $4xy + 2y = 9$

2. $8x - 3y = 6 - 4x$

3. $7x + y + 3 = y$

4. $5 - 2y = 3x$

5. $4y + x = 9x$

6. $a + \frac{1}{5}b = 2$

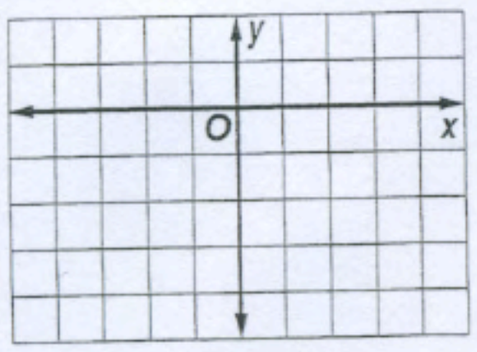
7. $6x = 2y$

8. $\frac{x}{4} - \frac{y}{3} = 1$

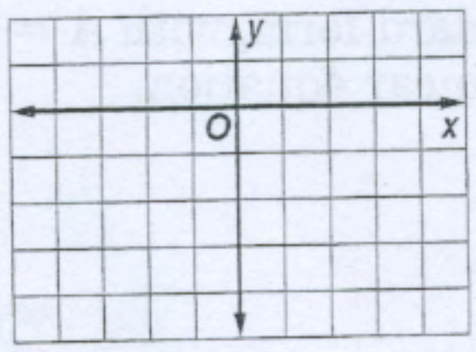
9. $\frac{5}{x} - \frac{2}{y} = 7$

Graph each equation.

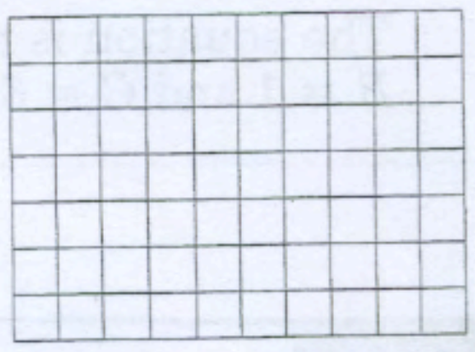
10. $\frac{1}{2}x - y = 2$



11. $5x - 2y = 7$

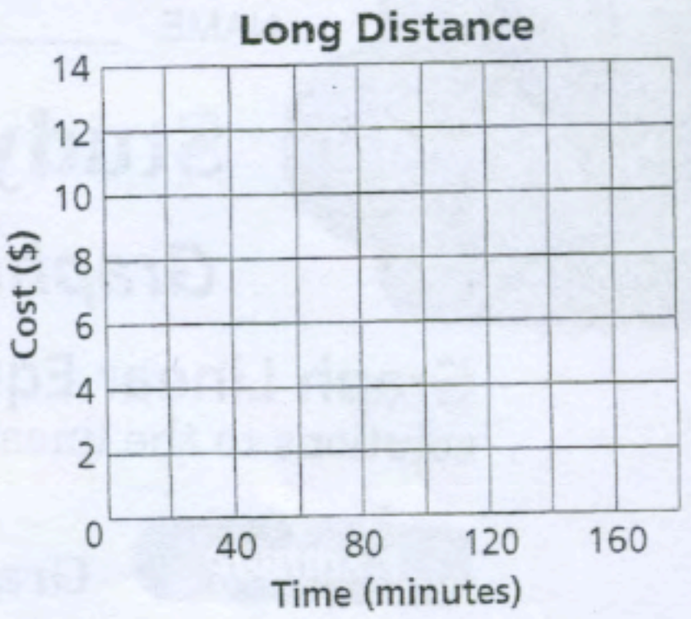


12. $1.5x + 3y = 9$



COMMUNICATIONS For Exercises 13–15, use the following information.

A telephone company charges \$4.95 per month for long distance calls plus \$0.05 per minute. The monthly cost c of long distance calls can be described by the equation $c = 0.05m + 4.95$, where m is the number of minutes.



13. Find the y-intercept of the graph of the equation.

14. Graph the equation.

15. If you talk 140 minutes, what is the monthly cost for long distance?

MARINE BIOLOGY For Exercises 16 and 17, use the following information.

Killer whales usually swim at a rate of 3.2–9.7 kilometers per hour, though they can travel up to 48.4 kilometers per hour. Suppose a migrating killer whale is swimming at an average rate of 4.5 kilometers per hour. The distance d the whale has traveled in t hours can be predicted by the equation $d = 4.5t$.

16. Graph the equation.

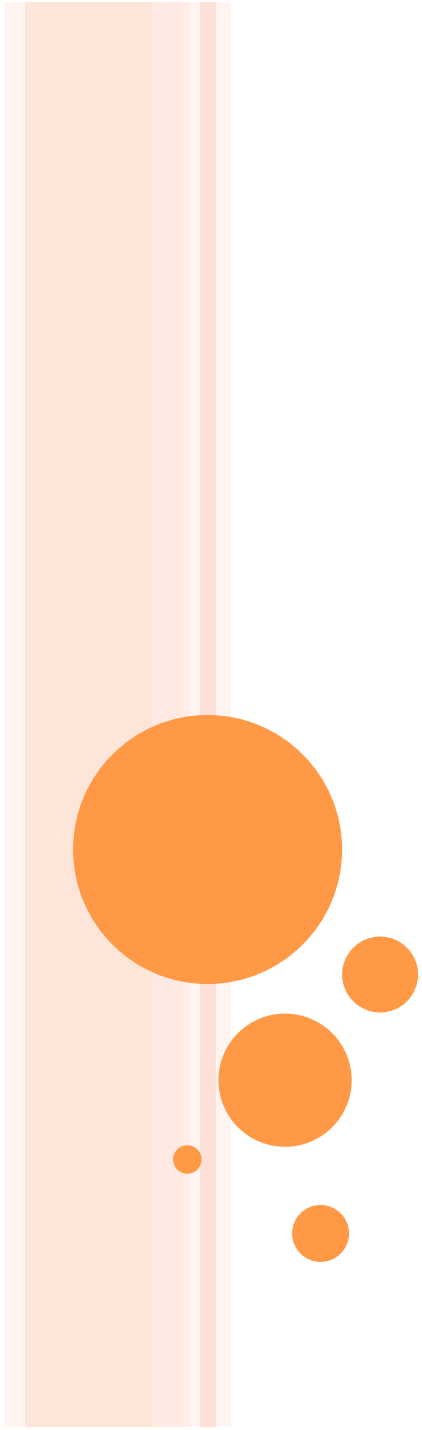
17. Use the graph to predict the time it takes the killer whale to travel 30 kilometers.

Revisions to Graphing Linear Equations AIW Task

I scanned in the Study Guide and Intervention side and inserted it into a Powerpoint Presentation. I broke it into several smaller segments. Each segment was cutoff when I foresaw the students getting caught up on math lingo or a new concept. I silently pressed next slide if no one asked a question. The goal was for the students to ask the good questions. I would not lead into anything. They had to ask the tough questions and they did a nice job.

- ☐ What is a linear equation?
- ☐ Does it always make a line?
- ☐ Do the lines have to be straight? How do you know?
- ☐ Why do we have to use Standard Form?
- ☐ Why is it called Standard Form?
- ☐ Will it always use 5 variables? [assuming the A, B, C, x and y were always variables]
- ☐ Why can't A and B both be zero?
- ☐ What are integers?
- ☐ Can A and B both be negative?
- ☐ What is a GCF?
- ☐ What is an example of an equation that doesn't have a GCF of 1?
- ☐ How do you know if an equation is a linear equation?
- ☐ How do you change an equation that isn't setup in Standard Form and get it into Standard Form?
- ☐ Can Standard Form have fractions/decimals?
- ☐ Can there be more than two variables in an equation?
- ☐ What happens if there are two of the same variable and they are on opposite sides of the = sign?
- ☐ How do you graph it?
- ☐ Why do you have to solve for y to graph if Standard Form is so important?
- ☐ How many values do you have to plug in?
- ☐ What if I plug them in and they don't land on the given graph?
- ☐ Is there a set of numbers that you [the teacher] usually pick?
- ☐ Why is "0" so nice to plug in?

Another change I made was having the students work in small groups for the Practice worksheet. On #s 1-9, I had them write it out in Standard Form if possible or write why they couldn't. This really helped them with their construction of knowledge and elaborated communication. They, themselves, could really tell what they did/didn't know.



Graphing Linear Equations

Identifying Linear equations

- A linear equation is an equation that forms a straight line on a graph
- All linear equations can be written in Standard Form

- If you can put it in Standard Form…Then it is a Linear Equation

Standard Form of a Linear Equation

$Ax + By = C$, where $A \geq 0$, A and B are not both zero, and A, B, and C are integers whose GCF is 1.

Example 1

Example 1 Determine whether $y = 6 - 3x$ is a linear equation. If so, write the equation in standard form.

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EXAMPLE 2

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Since the term $3xy$ has two variables, the equation cannot be written in the form $Ax + By = C$. Therefore, this is not a linear equation.

Graphing Linear Equations

- The graph of a linear equation is a line
- The line represents **all** the solutions to the linear equations
- Every ordered pair on the line makes the equation true

Example 3

Example Graph the equation $y - 2x = 1$.

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Solve the equation for y.

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Example **Graph the equation $y - 2x = 1$.**

Solve the equation for y.

$y - 2x = 1$	Original equation
$y - 2x + 2x = 1 + 2x$	Add $2x$ to each side.
$y = 2x + 1$	Simplify.

- Now What?

EXAMPLE 3

Example **Graph the equation $y - 2x = 1$.**

Solve the equation for y.

$$\begin{aligned} y - 2x &= 1 && \text{Original equation} \\ y - 2x + 2x &= 1 + 2x && \text{Add } 2x \text{ to each side.} \\ y &= 2x + 1 && \text{Simplify.} \end{aligned}$$

Select five values for the domain and make a table. Then graph the ordered pairs and draw a line through the points.

Example 3

x	$2x + 1$	y	(x, y)
-2	$2(-2) + 1$	-3	$(-2, -3)$
-1	$2(-1) + 1$	-1	$(-1, -1)$
0	$2(0) + 1$	1	$(0, 1)$
1	$2(1) + 1$	3	$(1, 3)$
2	$2(2) + 1$	5	$(2, 5)$